

PSYCHE.

THE OVIPOSITION AND CARNIVOROUS HABITS OF THE GREEN MEADOW GRASSHOPPER (*ORCHELIMUM GLABERRIMUM* BURMEISTER). — PLATE V.

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IN the early part of September, 1903, I caught several pairs of the orthopteron, *Orchelimum glaberrimum* Burm. (Pl. V) in a meadow among some coarse herbage. After keeping them alive under observation for several days in a large vivarium jar, they were allowed the freedom of flowers on the center table in my room. I found these insects very wild at first, but they afterwards became tamed and so adjusted to the indoor surroundings that they entered into conjugation. The means used in subjugating them were gentle treatment, occasional supply of water for drinking, and plenty of picked plants in blossom for foraging. The latter were often replenished during my various excursions afield. On the 6th of September a female was noticed exhibiting rather restless actions among the loosely spread stems of one of the bouquets of flowers above mentioned, and soon after I found her ovipositing in a stem of the bur marigold. The method of oviposition was thereafter studied and found of such peculiar interest that a detailed account is here offered. Before selecting the marigold as the proper plant for her immediate needs, *Orchelimum* tested a number of different kinds of plants by biting the stems. It was curious to see how quickly a decision was arrived at when she was engaged in this search. Grass, for instance, or other kind of plant distasteful to her, was either ignored entirely, or was subjected to a brief mouth test. When at last, after jumping from plant to plant, going up and down in the quest, the coveted stem was found, she started very vigorous biting, moving her head from side to side in an endeavor to get a stronger hold with her jaws. A gash into the outer layer of the stem was soon made, about an eighth of an inch in length, the insect finally going back over the course of the incision with the evident purpose of more deeply penetrating to the pith. During this first stage in the process the female stands with her head directed downwards, but as soon as the spot is prepared with the mouth she reverses her body preparatory to the act of oviposition. Firmly grasping the plant stem with her feet, she curves the abdomen underneath, at the same time bringing the pointed extremity of the ovipositor into the breach made in the stem

above described. Now she stands with her ovipositor under the abdomen with the blades slightly imbedded, but gradually as it is worked within the stem she almost imperceptibly moves forward a little at a time. Finally when the ovipositor is buried to its utmost length it is directed backwards. It is now appreciated how well adapted the beautiful curve and structure of the organ are for this purpose. A moment later the blades are spread apart, allowing the elongate egg to be lodged within the center of the pith, the latter having been pressed to either side for the accommodation of the egg. During this process the female is very quiet, the only noticeable movement being an occasional quiver of the abdomen. As soon as the first egg is deposited, she withdraws the ovipositor and immediately turning around she again bites the same spot, spending several minutes chewing the fibers and pinching the sides together with her powerful jaws. This is done in order to use the same opening to deposit the second egg as about to be described. She next moves a little way down the stem, but this time her head is directed downwards so that she may insert her ovipositor in the same hole but deposit the second egg in a reversed position to that of the first. No sooner is this second egg laid and her ovipositor removed than she turns about and treats the spot for the last time to the same manoeuvring of biting and pressing the sides together as before witnessed. The two eggs thus far laid have their anterior poles directed end to end with a slight distance between them. When the third and fourth eggs are about to be deposited she moves down the stem to a new site about half an inch away, varying the distance, and the process with its several stages is repeated. The interior of the stem is finally filled for a considerable distance with eggs, about ten minutes being consumed in the deposition of each one. It was during the critical moment when an egg was being deposited that I seized upon the opportunity of photographing the female as shown in the accompanying illustration. She had made nine incisions up to this time and was in the act of laying the eighteenth egg. Some of these incisions are easily seen in the illustration. When the eggs hatch doubtless two young escape from the same scarified point. On removing one side of the stem containing the eggs, in a longitudinal direction, they were found to lie with their corresponding poles nearest together throughout.

The eggs are slender and beautiful flesh-colored objects when freshly laid; they are nearly straight, about six mm. long and seven tenths mm. in width. The anterior pole is very slightly tapered, with bluntly rounded apex; the posterior pole is more distinctly reduced and the apex narrowly rounded. Usually the eggs are skillfully guided to their destined place within the pith, but that they sometimes meet with accident I can attest from observation. Occasionally through defective working of the mechanism, I have noted temporary arrest of oviposition due to

the egg sticking between the blades. When this happens the ovipositor is withdrawn, and turning up the tip underneath the body in a forward direction the female deliberately spreads the blades apart with her mouth and seizing the offending egg she immediately devours it. An egg which I took away from the female just as she was going through this performance was compressed transversely and somewhat distorted. This seemed to show that excessive lateral pressure brought to bear by the blades had caused the failure of the egg to be deposited.

It may be of interest to note that Riley ('84 Stand. Nat. Hist., p. 187, II) mentions that this species oviposits in the stems of various pithy plants, and especially in the tassel stem of Indian corn. I have not been so fortunate thus far as to observe this species ovipositing while it was in a free state of nature.

CARNIVOROUS HABITS.

I was once attracted to a cricket which was jumping about in a lively manner in one of my vivarium jars, and when I went nearer to make out what caused the disturbance I found that the cricket was frantically escaping from the depredations of a female *Orchelimum*. She had pounced upon her mate on the earth at the bottom of the jar, and seizing him by the back, near the base of the wings, she then jumped on the stem of a plant, in the meantime carrying her prey crosswise in her mouth. She paused here, and holding her mate's body between her front legs she ate the larger portion of the soft parts, after first eating a hole in the back. The manner in which this individual handled her prey indicated that the long spines of the first and middle tibiae are occasionally used and connected in this species with its carnivorous habits. Blatchley has recorded ('02 Orth. Indiana, p. 384) the fact that the allied species, *vulgare*, feeds upon the bodies of small moths which in some way it manages to capture, while on another occasion he observed a female on the flower of a golden-rod feasting on a soldier beetle.

Professor V. L. Kellogg, of Stanford University, will spend the coming academic year on leave of absence in Europe. Personal letters will be forwarded. Requests for reprints of papers or for specimens, etc., should be addressed, to avoid delay, to the Department of Entomology, Stanford University, Calif.